REMARKS

Applicant has amended claims 1 and 16. Claims 1 to 20 remain pending.

§ 103 Rejections

All Claim Limitations Must Be Taught or Suggested

Prior to addressing Applicant's prior arguments, the Examiner stated that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. However, Applicant's prior arguments demonstrated that the combinations of references do not teach or suggest all of the limitations in the claims. It is well-settled law that the combination of references asserted against a claim must teach or suggest each and every claim limitation. See In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). As the Board of Patent Appeal and Interferences has confirmed, a proper obviousness determination requires "a searching comparison of the claimed invention – including all its limitations – with the teaching of the prior art." See In re Wada and Murphy, Appeal 2007-3733, citing In re Ochiai, 71 F.3d 1565, 1572 (Fed. Cir. 1995). In sum, obviousness requires at least a teaching or a suggestion of all of the limitations in a claim and Applicant's prior arguments simply showed that the Examiner failed to so.

Note that Applicant did not find it necessary to address the lack of any suggestion or motivation to combine these references since their combinations failed to teach or suggest all of the limitations in the claims. Applicant has now addressed the lack of any suggestion or motivation to combine the references below to further rebut the rejections of the claims.

Claim 1

The Examiner rejected claim 1 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 7,215,812 ("Masaki") in combination with U.S. Patent App. Pub. No. 2004/0028271 ("Pollard et al.") and U.S. Patent No. 7,149,325 ("Pavlidis et al."). The Examiner cited Masaki for disclosing the first, the second, and the third claim elements, Pollard et al. for disclosing the fourth and the fifth claim elements, and Pavlidis et al. for disclosing the fourth and the fifth claim elements. Below Applicant shows that the references when combined do not teach or suggest each and every claim limitation.

Masaki

Applicant previously argued that Fig. 5 of Masaki does not disclose the first, the second, and the third claim elements of claim 1, which recite generating histograms of two overlapping regions in two images and determining corresponding pixel values from the histograms. The Examiner responded as follows:

> At Column 5, lines 3-6, 60-64 and Column 6, lines 6-19, Masaki teaches that the "judgment" or in other words the matching parameters are determined as to whether the color image is a sunset scene or not. Further since the contrast judgment can use the histograms of the image data created at the time of the sunset judgment and the color covering judgment, a photographed image has sharp edges just as a photographed scene taken in a cloudy weather although its contrast is low. This teaching demonstrated that there are multiple images take to create histograms (first and second histograms) that have overlapping features. It clearly is taught that the image with the sharp edges is analyzed, similarly, the image with cloudy weather is analyzed. Masaki more than adequately teaches a first histogram and a second histogram on a first and second image are taught in this reference.

December 30, 2008 Final Office Action, pp. 23 and 24. The Examiner appeared to argue that Masaki discloses a sunset judgment, a color covering judgment, a contrast judgment, and a sharpness judgment that use histograms generated from multiple images with overlapping features. Applicant respectfully traverses.

Masaki discloses an image processing method executed by an image processing apparatus 1 to determine if one or more types of corrections are necessary before applying any correction to a color image. Masaki, col. 5, lines 24 to 34; Fig. 2. Image processing apparatus 1 uses a judgment 21 to determine if the color image is (1) a sunset scene, (2) color-covered, (3) normal in contrast, and (4) normal in sharpness.

> In other words, the judgment as to whether the color image is a sunset scene or not (hereinafter referred to as a sunset judgment) is carried out on the basis of the histogram distribution of image data of part of color components in the range of red to yellow as described below. The judgment as to whether the color image is color-covered or not (hereinafter referred to as a color covering judgment) is carried out on the basis of the histogram distribution of image data of the whole of color components in the range of red to blue as described below. Since the processing load for the color covering judgment is higher than that for the sunset judgment, the sunset judgment is carried out earlier than the color covering judgment to attain efficient judgment.

> Furthermore, the judgment as to whether the color image is normal in contrast or not (hereinafter referred to as a contrast judgment) is carried out after the sunset judgment and the color covering judgment in view of judgment efficiency, since the contrast judgment can use the histograms of the image data created at the time of the sunset judgment and the color covering judgment. A photographed image has sharp edges just as a photographed scene taken in cloudy weather although its contrast is low. In order to be able to judge the contents of such a photographed scene, the judgment as to whether the color image is normal in sharpness or not (hereinafter referred to as a sharpness judgment) is carried out after the contrast judgment in consideration of judgment accuracy.

Id., col. 5, lines 49 to col. 6, line 19; Fig. 3. As described below, the histograms used for the sunset judgment, the color covering judgment, and the contrast judgment are all generated from the same color image and not from different color images as asserted by the Examiner, let alone overlapping regions in two different color images. Furthermore, the sharpness judgment does not involve the use of any histogram.

For the sunset judgment, image processing apparatus 1 calculates the product P of the hue data H and the saturation data S of the pixels in the image, calculates the product Q of the hue data H and the lightness data L of the pixels in the image, generates a histogram of the product P and a histogram of the product Q, and calculates the variance value Sp of the histogram of the product P and the variance value Sq of the histogram of the product Q. Id., col. 7, lines 15 to 21; col. 7, lines 59 to col. 8, line 11; Fig. 4. Image processing apparatus 1 then compares the variance values Sp and Sq with the predetermined threshold values Kp and Kq to determine if the image is a sunset scene. Id., col. 8, lines 13 to 21; Fig. 4.

For the color covering judgment, image processing apparatus 1 extracts the pixels in the image that have the lightness data L in a range from 15 to 85 and creates a histogram of the hue data H of the extracted pixels. Id., col. 8, lines 46 to 54; Fig. 6. Image processing apparatus 1 next determines if 85% or more of the pixels in the histogram is intensively distributed in a predetermine range W1 as shown in Fig. 7, which indicates the image is not color-covered. Id., col. 8, line 54 to col. 9, line 1; Fig. 7. Image processing apparatus 1 then determines if 80% or more of the pixels in the histogram is intensively distributed in a predetermine range W2 as shown in Fig. 8, which indicates the image is color-covered. Id., col. 9, lines 1 to 14; Fig. 8.

For the contrast judgment, image processing apparatus 1 creates histograms of the color components R, G, and B of the pixels in the image, and determines if the ratios of the range dr, dg, and db to the whole class range D as defined in Fig. 10 are larger than predetermined threshold value

Kr, Kd, and Kb. Id., col. 9, lines 19 to 39; Figs. 9 and 10. Instead of using R, G, and B, image processing apparatus 1 may use H, S, and L, in which case the histogram for the lightness data L created in the sunset judgment may be reused. Id., col. 9, lines 40 to 47.

For the sharpness judgment, image processing apparatus 1 determines the sharpness of the image by extracting the pixels at the edge portions of the image, calculating high frequency components of the extracted pixels, and normalizing the intensity of the high frequency components. Id., col. 9, lines 53 to 63. Image processing apparatus 1 then determines if the sharpness is higher than the predetermined threshold values, which indicates the image has normal sharpness. Id., col. 9, lines 64 to 67.

As described above, Masaki discloses image processing apparatus 1 applies a sunset judgment, a color covering judgment, a contrast judgment, and a sharpness judgment to a color image before applying any correction to the image. Thus, any histograms generated from these judgments are all created from the same image. While image processing apparatus 1 may repeat the process for additional color images, Masaki does not disclose histograms generated for one color image are compared to histograms generated for another color image. The histograms generated from one image are only used for the sunset judgment, the color covering judgment, the contrast judgment, and the sharpness judgment for that image. Furthermore, Masaki does not disclose any two color images have overlapping regions.

In contrast, claim 1 recites a "method for color matching a first image and a second image, wherein a first region of the first image and a second region of the second image overlap." The first, the second, and the third claim elements of claim 1 recites "generating a first histogram of the first region; generating a second histogram of the second region; determining corresponding pixel values from the first and the second histograms …." Masaki simply does not disclose generating histograms from two overlapping regions in two different images and determining corresponding pixel values from the histograms because it is concerned about color correcting one image at a time and it is not concerned about color matching two images.

Neither Pollard et al. nor Pavlidis et al. cures the deficiencies of Masaki.

Pollard et al.

Applicant previously argued that paragraph [0108] of Pollard et al. does not disclose the fourth claim element of claim 1, which recites determining a parameter of the OECF that best

matches corresponding pixels from histograms of overlapping regions of two images. The Examiner responded as follows:

> Although the applicant has suggested that Pollard only teaches "performing correction of the OECF of a camera sensor", further at paragraph [0108], Pollard further teaches that the RGB image data is reconstructed and compressed and stored in long term memory. Additionally at paragraph [0110], Pollard also teaches that the embodiment of the invention has been described with reference to the Bayer pattern of image pixels, but the invention is also applicable to cases where not all rows and/or columns contain image pixels of at least two colors. The invention is equally applicable to such image mosaics. The Examiner is stating that Masaki in combination with Pollard teaches the claimed elements of Claim 1. The processing that occurs in Pollard along with the combination of the processing of the histograms as taught by Masaki more than adequately teaches these claimed limitations.

December 30, 2008 Final Office Action, pp. 24 and 25. Applicant respectfully traverses.

As Masaki does not disclose generating histograms of overlapping regions of two images and determining corresponding pixel values from the histograms, the combination of Pollard et al. and Masaki cannot disclose determining at least one parameter of the OECF that best matches the corresponding pixel values from the histograms. Furthermore, Pollard et al. does not disclose determining a parameter of the OECF that best matches any two regions, let alone two overlapping regions in two images. Pollard et al. only discloses that "a pre-processing stage 92 … may typically include correction of the OECF … of the sensor … to compensate for variations in illuminations." Pollard et al., paragraph [0108] (emphasis added).

The additional reference to paragraph [0110] of Pollard et al. does not cure the deficiencies of the Examiner's assertions. Paragraph [0110] discloses that the invention is applicable to devices with an imaging sensor array having a color filter pattern that is different than the Bayer pattern. Paragraph [0110] is completely unrelated to determining a parameter of the OECF that best matches any two regions, let alone two overlapping regions in two images.

Applicant notes that the Examiner did not address Applicant's prior argument regarding the fifth claim element. For this reason alone claim 1 should be patentable over the cited references.

Neither Masaki nor Pavlidis et al. cures the deficiencies of Pollard et al.

Pavlidis et al.

Applicant previously argued that Pavlidis et al., at col. 26, lines 25 to 36, does not disclose the third element of claim 1, which recites determining corresponding pixels from the two histograms. The Examiner responded as follows:

> Figure 15, numeral 325 teaches 3 histograms and column 25, lines 39-46 specifically teaches "the color signature of images 322 goes into a compare and match unit or component 325. The color signature of image 322 is compared with other signatures in the database 325 and matched with one that have a matching value of a predetermined value or greater. This element more than adequately teaches determining corresponding pixels from two histograms.

December 30, 2008 Final Office Action, p. 25. Applicant respectfully traverses.

Fig. 15 of Pavlidis et al. discloses a compare and match unit 324 that compares the histogram of an image 322 with the histograms of other images in a database 325 to determine the best matched histograms. Pavlidis et al., col. 25, lines 39 to 46. Compare and match unit 324 compares two histograms by determining the smaller number (i.e., the intersection) of pixels in the two bins of the same color pixel value for each of the color pixel values, sums the intersection numbers, and divide the sums by the total number of pixels. Id., col. 26, lines 36 to 55. However, Pavlidis et al. does not determine any correspondence between pixel values from the two histograms. Pavlidis et al. only determines the intersection numbers of the two bins of the same color pixel value in the two histogram for each of the color pixel values.

Suggestion or Motivation to Combine Masaki, Pollard et al., and Pavlidis et al.

The Examiner argued that Masaki, Pollard et al., and Pavlidis et al. are in the same field of color image processing, and more specifically color correction. December 30, 2008 Final Office Action, p. 4. The Examiner then argued that the claim elements are well known in the prior art and one skilled in the art could have combined the teachings of Masaki, Pollard et al., and Pavlidis et al. with no changes to function and the combination would have yielded predictable results. December 30, 2008 Final Office Action, pp. 4 and 5. Applicant respectfully traverses.

Applicant first summarizes Masaki, Pollard et al., and Pavlidis et al. Masaki discloses a method that determines whether or not different types of corrections are necessary for a color image before applying the corrections to the color image. Different types of histograms are generated from the color image to determine whether or not the different types of corrections are necessary.

Pollard et al. discloses a method to color correct a color image by splitting the image into a low frequency image and a high frequency image. The low frequency image may be color corrected and then combined with the high frequency image to provide a color corrected image. When the method is implemented in a digital camera, it includes a pre-processing stage before the color correction where the OECF of the image sensor is corrected to compensate for variation in lighting.

Pavlidis et al. discloses a method to track an object by segmenting the object from the background in a color image and extracting a histogram from the object. The histogram is compared with other histograms in a database to identify the object.

While Masaki and Pollard et al. disclose methods to color correct images, Pavlidis et al. discloses a method to track an object. Thus, one skilled in the art would not consider Pavlidis et al. because it is nonanalogous art that addresses a different problem than the present application.

Even assuming one skilled in the art would consider Pavlidis et al, there is no suggestion or motivation to create histograms for correcting a color image as taught by Masaki, and then to match the histograms with other histograms in a database for identifying objects as taught by Pavlidis et al. Modifying Masaki with Pavlidis et al. renders Masaki unsatisfactory for its intended purpose of correcting a color image as the resultant would instead identify an object from the color image.

There is also no suggestion or motivation to follow the above steps with the correction of OECF to compensate illumination as taught by Pollard et al. Pollard et al. discloses the correction of OECF as a pre-process that occurs before color correction. In other words, Pollard et al. teaches against using OECF after color correction as suggested by the Examiner.

For all of the above reasons, claim 1 is patentable over Masaki, Pollard et al., and Pavlidis et al.

Claims 16

Claim 16 recites similar limitations as claim 1 and it is patentable for at least the same reasons as claim 1.

Claims 2 to 5 and 17

Claims 2 to 5 and 17 depend directly or indirectly from claim 1 or 16, and are patentable for at least the same reasons as claims 1 and 16.

Claims 6 to 8, 10 to 13, 15, 18, and 20

Claims 6 to 8, 10 to 13, 15, 18, and 20 depend directly or indirectly from claim 1 or 16, and they are patentable for at least the same reasons as claims 1 and 16.

Allowable Subject Matter

The Examiner indicated that claims 9, 14 and 19 are allowable if rewritten in independent form including all of the limitations of their base claims and any intervening claims. Applicant has not amended these claims to independent form because Applicant believes that their base claims are patentable over the cited references.

Summary

Applicant has amended claims 1 and 16, and claims 1 to 20 remain pending. For the above reasons, Applicant respectfully requests the Examiner to withdraw the claim rejections and allow claims 1 to 20. Should the Examiner have any questions, please call the undersigned at (408) 382-0480.

I hereby certify that this correspondence is being transmitted prior to expiration of the set period of time by being transmitted via the Office electronic filing system in accordance with § 1.6(a) (4).

/David C Hsia/ April 9, 2009
Signature Date

Respectfully submitted,

/David C Hsia/

David C. Hsia
Attorney for Applicant(s)
Reg. No. 46,235

Patent Law Group LLP
2635 North First St., Ste. 223
San Jose, California 95134
408-382-0480x206